

Claims:

1. A transmission comprising:
 - a housing;
 - a shaft in the housing;
 - 5 a helical gear on the shaft and meshing with another helical gear such that torque applied to the gears imparts a thrust load to the shaft;
 - a first bearing supporting the shaft in the housing and being capable of transferring radial loads between the shaft and the housing;
 - 10 a second bearing supporting the shaft in the housing and being capable of transferring both radial loads and thrust loads in both axial directions between the shaft and the housing, the second bearing including:
 - a cone located around the shaft and having a tapered raceway presented outwardly away from the shaft;
 - 15 a cup located in the housing and having a tapered raceway presented inwardly toward the raceway on the cone;
 - a small rib at the small end of the tapered raceway on the cone;
 - 20 a large rib at the larger end of the tapered raceway on the cup; and
 - tapered rollers located in a single row between the raceways and between the ribs, and having side faces against the raceways and large and small end faces along the large and small ribs, respectively.
- 25 2. A transmission according to claim 1 wherein the first bearing includes:
 - an inner race on the shaft and having an outwardly presented cylindrical raceway;
 - an outer race in the housing and having an inwardly presented cylindrical raceway presented toward the raceway of the inner race;

cylindrical rollers located between the raceways of the inner and outer races and being capable of sliding axially on at least one of the raceways.

3. A transmission according to claim 2 wherein one of the races 5 of the first bearing has ribs between which the rollers are located.

4. A transmission according to claim 1 wherein the small rib is formed integral with the cone of the second bearing and the large rib as formed separately from the cup of the second bearing.

5. A transmission according to claim 1 and further comprising: 10 a second shaft on which another helical gear is carried, with that helical gear meshing with the helical gear that is carried by the shaft that is supported on the first and second bearings.

a third bearing supporting the second shaft in the housing and being capable of transferring radial loads between the shaft and the housing;

15 a fourth bearing supporting the second shaft in the housing and being capable of transferring both radial loads and thrust loads in both axial directions between the shaft and the housing, the fourth bearing including:

a cone located around the second shaft and having a tapered raceway presented outwardly away from the second shaft;

20 a cup located in the housing and having a tapered raceway presented inwardly toward the raceway on the cone;

a small rib at the small end of the tapered raceway on the cone;

a large rib at the large end of the tapered raceway on the cup;

25 and

tapered rollers located in a single row between the raceways and between the ribs, and having side faces against the raceways and large and small end faces along the large and small ribs, respectively.

30 6. A transmission according to claim 5 wherein the third bearing includes:

an inner race on the second shaft and having an outwardly presented cylindrical raceway;

an outer race in the housing and having an inwardly presented cylindrical raceway presented toward the raceway of the inner race;

5 cylindrical rollers located between the raceways of the inner and outer races and being capable of sliding axially on at least one of the raceways.

7. A transmission according to claim 6 wherein one of the races of the third bearing has ribs between which the cylindrical rollers are located.

10 8. A transmission according to claim 5 wherein the small rib of the fourth bearing is formed integral with the cone of the fourth bearing and the large rib of the fourth bearing is formed separately from the cup of the fourth bearing.

9. A transmission according to claim 1 wherein the housing has 15 a bearing seat in which the cup of the second bearing is received, and the cup at one of its ends has a flange which is too large to be received in the seat for the cup, whereby the cup will fit into the seat in only one orientation.

10. A transmission for a wind turbine having a rotor and a generator, said transmission comprising:

20 a housing;
a planetary set in the housing and being connected to the rotor;
a drive shaft also connected to the planetary set such that it rotates at an angular velocity greater than the velocity of the rotor;

25 a helical bull gear on the drive shaft;
an intermediate shaft in the housing;
locating and nonlocating antifriction bearings supporting the intermediate shaft in the housing;

 a helical gear and a helical pinion carried by the intermediate shaft, with the pinion meshing with the bull gear;

30 an output shaft in the housing and being connected to the generator;
locating and nonlocating antifriction bearings supporting the output shaft in the housing; and

a pinion carried by the output shaft and meshing with the helical gear on the intermediate shaft; and wherein

the nonlocating bearing transfers radial loads between their shafts and the housing; and wherein the locating bearings each comprise:

5 a cone on the shaft supported by the bearing and having a tapered raceway that is presented away from the shaft;

a cup in the housing and having a tapered raceway that is presented toward the raceway on the cone,

a small rib at the small end of the raceway on the cone;

10 a large rib at the large end of the raceway on the cup;

tapered rollers arranged in a single row between the raceways on the cone and cup and between the ribs, with the tapered side faces of the rollers being against the raceways and the small and large end faces of the rollers being along the small and 15 large ribs, respectively.

11. A transmission according to claim 10 wherein each nonlocating bearing comprises:

an inner race located around the shaft supported by the bearing and having a cylindrical raceway that is presented outwardly away from the 20 shaft;

an outer race located in the housing and having a cylindrical raceway presented inwardly toward the raceway on the inner race, cylindrical rollers located between the raceways of the races; and

25 ribs on one of the races for maintaining the rollers along the raceways.

12. A transmission according to claim 11 wherein the ribs of each nonlocating bearing are on the outer race of the bearing.

13. A transmission according to claim 10 wherein the bull gear, when driven by torque transmitted through the planetary set from the rotor, 30 induces a thrust in the intermediate shaft and the helical gear induces a thrust in the output shaft, and wherein the locating bearings are oriented

such that the thrusts in the shafts are transferred to the housing through the rollers of the locating bearings at the raceways of the locating bearings.

14. A transmission according to claim 10 wherein the housing has bearing seats in which the cups of the locating bearings are received, and

5 each cup at one end has a flange which is too large to be received in the seat for the cup, whereby the cup will fit into the seat in only one orientation.